WHAT IS CLAIMED IS:

1. A method for fabricating high power density solid oxide fuel cells, comprising:

providing a layer of electrolyte material,

forming a buffer layer on the layer of electrolyte material by colloidal spray deposition, and

forming a layer of electrode material on the buffer layer.

2. The method of Claim 1, wherein forming the layer of electrode material is carried out by colloidal spray deposition.

3. The method of Claim 1, wherein providing the layer of electrolyte material is carried out by forming the electrolyte material form zirconia.

4. The method of Claim 3, wherein said electrolyte material is composed of doped-zirconia selected from the group of dopants consisting of yttria, ytterbia, and scandia.

5. The method of Claim 1, wherein forming the buffer layer is carried by depositing doped-ceria.

6. The method of Claim 5, additionally including forming the doped-ceria by doping ceria with an element of the lanthanides and/or yttria.

7. The method of Claim 6, wherein the doped ceria has a doping element selected from the group consisting of gadolinium and yttrium.

8. The method of Claim 1, wherein forming the layer of electrode material is carried out by depositing cobalt iron based material on the buffer layer.

9. The method of Claim 8, wherein depositing the cobalt iron based material is carried out by depositing an electrode composed of (La,Sr)(Co,Fe)O.

10. The method of Claim 8, wherein depositing the cobalt iron based material is carried out by colloidal spray deposition.

11. The method of Claim 1, additionally including forming the layer of electrode material using a composite of a mixture of doped-ceria and cobalt iron based material.

12. The method of Claim 1, wherein the electrolyte material is formed to be composed of zirconia, the buffer layer is formed to be composed of doped-ceria, and the electrode material is formed to be composed of (La,Sr)(Co,Fe)O.

13. A solid oxide fuel cell, comprising:

a zirconia electrolyte,

a layer of doped-ceria deposited on said zirconia electrolyte, and

a cobalt iron based electrode deposited on the layer of doped-ceria,

said solid oxide fuel cell having a peak power density of up to 1400 mW/cm^2 at 800 °C and up to 900 mW/cm^2 at 700 °C.

14. The solid oxide fuel cell of Claim 13, having a power density in the range of 250 mW/cm^2 to 1400 mW/cm^2 at a temperature range of 600 °C to 800 °C.

15. The solid oxide cell of Claim 13, wherein said cobalt iron based electrode is composed of (La,Sr)(Co,Fe)O.

16. The solid oxide fuel cell of Claim 13, wherein said cobalt iron based electrode includes doped-ceria.

17. The solid oxide fuel cell of Claim 13, wherein said doped-ceria is composed of ceria doped with any element of the lanthanides.

18. The solid oxide fuel cell of Claim 17, wherein the ceria is doped with gadolinium or yttrium.

19. The solid oxide fuel cell of Claim 13, having a composite cathode of a mixture of doped-ceria and LSCF.

20. The solid oxide fuel cell of Claim 13, having a configuration on the cathode

side composed of layers of doped-zirconia/doped-ceria/LSCF+doped-ceria/LSCF, and wherein the LSCF layer functions as a current collector.

21. In a method for producing solid oxide fuel cells composed of a zirconia electrolyte and a cobalt iron based electrode, the improvement, comprising:

forming a doped-ceria buffer layer between the electrolyte and the electrode by colloidal spray deposition.

22. The improvement of Claim 21, additionally including forming the doped-ceria from ceria doped with gadolinium or yttrium.

23. The improvement of Claim 21, additionally including forming the cobalt iron based electrode by colloidal spray deposition.

24. The improvement of Claim 23, additionally including forming the electrode from a mixture of doped-ceria and cobalt iron based material.

25. The improvement of Claim 21, wherein the colloidal spray deposition is carried out by forming a doped-ceria sol, delivering the sol to a liquid dispersing means, and spraying the sol in mist of fine droplets onto a heated zironia electrolyte.

26. The solid oxide fuel cell of Claim 13, wherein said electrolyte has a thickness of 1-40 μm, the layer of doped-ceria has a thickness of 0.5-40 μm, and the cobalt iron based electrode has a thickness of 10-100 μm.

27. The solid oxide fuel cell of Claim 26, wherein said electrolyte has a thickness of 1-20 μm, and said layer of doped-ceria has a thickness of 0.5-5 μm.